Appendix H – Best Management Practices

This Appendix lists the Best Management Practices (BMPs) that apply to the Sierra National Forest Travel Management Project. These practices may apply to any of several phases of the project: they may have been applied in project planning; they may apply to the management of facilities that are being added to the NFTS; or they may apply to the actions that are needed in order to bring facilities up to standards so that they may be added to the NFTS. This Appendix includes a table (Table H- 1) that specifies to which of these phases each BMP applies, and provides information on how it will / has been applied. Table H- 2 provides a crosswalk that displays which BMPs apply to each of the Soil and Watershed measures listed in Appendix A, as an aid to project implementation.

Table H- 1. Applicable BMPs

BMP Name, Objective, and Direction	Locations and/or 'Actions Needed' Where Applies	How to Apply to the Sierra NF Travel Management Project
BMP 1-8 Streamside Management Zone Designation: To designate a zone along riparian areas, streams and wetlands that will minimize potential for adverse effects from adjacent management activities. Management activities within these zones are designed to improve riparian values.	All locations where heavy equipment or motor vehicles are used near stream channels	Streamside management zones (SMZs) and Riparian Management Areas (RMAs) are defined in Sierra Supplement No 1 (USDA Forest Service 1989). They include 100-ft buffers around all perennial features, including meadows, and buffers ranging from 75 to 25 feet wide around non-perennial stream channels, based on Channel Class. Within SMZs and RMAs, the constraints defined in Sierra Supplement No. 1 (USDA Forest Service, 1989) apply. These include the maintenance of a minimum of 50% well-distributed groundcover in all areas except permitted roads and trails. In areas where 50% groundcover is not met, treatments shall be applied to attain this minimum level of protection. During the implementation of work needed to bring routes up to standards prior to their addition to the NFTS, vehicles including heavy equipment will be restricted to existing routes except as described in other BMPs (for example, BMP 2-14). Some other BMPs (for example, BMP 2-10 and 2-11) apply within SMZs. For any work where equipment will require off-route access near stream channels or meadows, or where side casting will occur, these zones will be delineated on the ground. A hydrologist or fisheries biologist may modify these guidelines where site-specific needs exist.

<table>
<tr><th>BMP Name, Objective, and Direction</th><th>Locations and/or 'Actions Needed' Where Applies</th><th>How to Apply to the Sierra NF Travel Management Project</th></tr>
<tr><td>BMP 2-1 General Guidelines for the Location and Design of Roads: To locate and design roads and motorized trails with minimal resource damage.</td><td>SW-16, SW-17, AW-3, AW-4, AW-7, AW-8, BO-2, HR-2</td><td>The following considerations were incorporated into the selection of motorized trails for the managed system, and also apply to realignment of added routes:
(a) Transportation facilities will be developed and operated to best meet resource management objectives with the least adverse effect on environmental values.
(b) The location, design, and construction or improvement of motorized trails will include the use of the IDT.
(c) Sensitive areas such as wetlands, inner gorges, and unstable ground will be avoided to the extent practicable.
(d) Stream crossings will be designed to provide the most cost efficient drainage facility consistent with resource protection, facility needs, and legal obligations.</td></tr>
<tr><td>BMP 2-7 Control of Road Drainage: To minimize the erosive effects of water concentrated on roads (and motorized trails), to disperse runoff from road surfaces, to lessen sediment yield from roaded areas, and to minimize erosion of the road prism.</td><td>SW-2, SW-3, SW-4, SW-7</td><td>Water bars or other drainage structures will be located so as to disperse concentrated flows and filter out suspended sediments prior to entry into streamcourses.

The following direction for drainage spacing is taken from the Sierra LRMP, S&G 128, which is shown in its entirety in the Watershed section of Chapter 3. HEHR = High Erosion Hazard Rating soils; VHEHR = Very High Erosion Hazard Rating soils.

<table>
<tr><td rowspan="2">Slope (%)</td><td colspan="2">Drainage spacing (ft)</td></tr>
<tr><td>HEHR</td><td>VHEHR</td></tr>
<tr><td>0-15</td><td>150</td><td>125</td></tr>
<tr><td>15-35</td><td>75</td><td>45</td></tr>
<tr><td>35-65</td><td>35</td><td>20</td></tr>
<tr><td>>65</td><td>15</td><td>15</td></tr>
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</td></tr>
<tr><td>BMP 2-9 Timely Erosion Control Measures on Incomplete Roads and Stream Crossing Projects: To minimize erosion and sedimentation from disturbed ground on incomplete projects.</td><td>SW-8, SW-9, SW-16, SW-17, SW-22</td><td>Implementation of stream crossing improvements and route realignments will be planned for periods when precipitation is not expected, and are small enough undertakings that they would not need to be left incomplete over a winter.
However, if these projects are in progress when precipitation is predicted, preventative measures will be put in place. These include actions such as ensuring that stockpiled material will not be transported into a stream channel, ensuring that adequate drainage features are present on a route to control runoff and prevent erosion and sediment delivery, or mulching freshly disturbed areas.</td></tr>
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BMP Name, Objective, and Direction	Locations and/or 'Actions Needed' Where Applies	How to Apply to the Sierra NF Travel Management Project
BMP 2-10 Construction of Stable Embankments (Fills): To construct embankments with materials and methods that minimize the possibility of failure and subsequent water quality degradation.	SW-13, SW-22	When constructing embankments for SW-13 and SW-22, follow the following guidelines for construction of stable embankments: use inorganic material only; do not sidecast or end dump material in SMZs; place material in layers and compact each layer; construct retaining walls, plant, or use a combination of techniques to stabilize the fill.
BMP 2-11 Control of Sidecast Material During Construction and Maintenance: To minimize sediment production originating from sidecast material during construction or maintenance.	SW-2, SW-3, SW-6, SW-14, SW-15, SW-16, SW-17, SW-23, SW-25, AW-3, AW-4, AW-7, AW-8, BO-2, HR-2	Sidecasting is not permitted within SMZs and should be avoided in all areas where the material could impact water quality. Waste areas must be located where excess material can be deposited and stabilized.
BMP 2-12 Servicing and Refueling Equipment: To prevent pollutants such as fuels, lubricants, bitumens and other harmful materials from being discharged into or near rivers, streams and impoundments, or into natural or man-made channels.	SW-2, SW-3, SW-6, SW-7, SW-8, SW-9, SW-10, SW-12, SW-13, SW-14, SW-15, SW-16, SW-17, SW-19, SW-22, SW-23, SW-25, AW-3, AW-4, AW-7, AW-8, BO-2, HR-2	This BMP applies to all actions that utilize heavy equipment. Storage of hazardous materials (including fuels) and servicing and refueling of equipment will be conducted outside of RCAs and CARs (2004 ROD S&G #99). If fueling and/or storage of hazardous materials are needed within RCAs or CARs, those sites must be reviewed and approved by a hydrologist or aquatic biologist. Additional protection measures, such as containment devices, may be necessary.

BMP Name, Objective, and Direction	Locations and/or 'Actions Needed' Where Applies	How to Apply to the Sierra NF Travel Management Project
BMP 2-13 Control of Construction and Maintenance Activities Adjacent to SMZs: To protect water quality by controlling maintenance actions in and adjacent to SMZs so that SMZ functions are not impaired.	SW-2, SW-3, SW-6, SW-7, SW-8, SW-9, SW-10, SW-13, SW-14, SW-15, SW-16, SW-17, SW-19, SW-22, SW-23, SW-25, AW-3, AW-4, AW-7, AW-8, BO-2, HR-2	Mechanized equipment may not leave the road or motorized trail surface within SMZs while performing maintenance. Woody debris (from brushing) may be disposed of within the SMZ but must not be placed within channels or on floodplains. Sidecast and fill materials will be kept out of SMZs except at designated crossing sites, to minimize effects to the aquatic environment.
BMP 2-14 Controlling In-Channel Excavation: To minimize stream channel disturbances and related sediment production.	SW-6, SW-8, SW-9, SW-10, SW-22	When working near streams or improving stream crossings, limit the presence and movement of heavy equipment in the stream channel to what is necessary to complete the work. In addition, follow these minimum water quality protection requirements: do not disturb the natural streambed adjacent to the structure being installed without IDT approval; minimize disturbance to streambeds and banks; if disturbance occurs, restore stream channels to their appropriate configuration; stabilize disturbed stream banks.
BMP 2-17 Bridge and Culvert Installation: To minimize sedimentation and turbidity resulting from excavation for in-channel structures.	SW-8, SW-9, SW-10, SW-13, SW-22	Spoil material generated during construction should not obstruct the stream or floodplain, or impair the function of the crossing structure. Preventative measures include: 1) keep excavated material out of channels; 2) remove any material stockpiled on the floodplain prior to any expected precipitation event; and 3) divert water around work site, if necessary to prevent downstream sedimentation.
BMP 2-19 Disposal of Right-of-Way and Roadside Debris: To ensure that organic debris generated during road construction and maintenance is kept out of streams so that channels, aquatic organism passage, and downstream facilities are not obstructed	SW-2, SW-3, SW-16, SW-17, SW-25, AW-3, AW-4, AW-7, AW-8, BO-2, HR-2	Any organic material generated during realignment or maintenance actions should be disposed of outside of the SMZ, except where needed as filter material on drain dip outlets to prevent sediment delivery to streams.

BMP Name, Objective, and Direction	Locations and/or 'Actions Needed' Where Applies	How to Apply to the Sierra NF Travel Management Project
BMP 2-22 Maintenance of Roads: To maintain roads and motorized trails in a manner that provides for water quality protection by minimizing rutting, failures, sidecasting, and blockage of drainage facilities, all of which can cause erosion, sedimentation, and deteriorating watershed conditions.	All added NFTS facilities; SW-2, SW-3, SW-25	Roads and motorized trails will be maintained to protect the transportation system and to ensure that damage to adjacent land and resources is prevented. This may require annual inspection to determine work needed. (a) At a minimum, maintenance must protect drainage facilities and runoff patterns. (b) Additional maintenance, such as spot rocking or installation of additional drainage features, should be chosen to respond to resource needs. Project crew leaders and supervisors are responsible for ensuring that projects meet specifications and project design criteria.
BMP 2-23 Road Surface Treatment to Prevent Loss of Materials: To minimize the erosion of road surface materials and consequently reduce the likelihood of sediment production from those areas	SW-3, SW-7	Use gravel or other surface hardening technique to harden constructed drainage structures on specified routes to prolong their useful life and to stabilize eroding stream channel approaches on specified routes.
BMP 2-24 Traffic Control During Wet Periods: To reduce surface disturbance and the rutting of roads and trails, and to minimize sediment washing from disturbed road and motorized trail surfaces.	SW-1	Unsurfaced roads and motorized trails that are not improved to accommodate all-weather or winter use will be subject to closure periods to protect the surface from rutting and erosion that could impact water quality or aquatic habitats.

BMP Name, Objective, and Direction	Locations and/or 'Actions Needed' Where Applies	How to Apply to the Sierra NF Travel Management Project
BMP 2-26 Obliteration or Decommissioning of Roads: To reduce sediment generated from unneeded non-system roads and motorized trails by obliterating or decommissioning them.	SW-19, SW-20; Follow-up projects	Non-system motorized tracks that are not identified to be added to the managed trail system should be assessed for obliteration opportunities and priorities. High priority tracks should be identified to facilitate the initiation of follow-up decommissioning projects.
BMP 4-7 Water Quality Monitoring of OHV Use According to a Developed Plan: To determine if, when, and to what extent OHV use causes adverse effects to water quality.	Green-Yellow-Red monitoring on all additions to the NFTS; Water quality / V* monitoring in specified locations identified in monitoring plan	Each Forest OHV Plan will: Identify areas or routes where OHV use could cause degradation of water quality; Establish baseline water quality data as a basis from which to measure change; Identify water quality standards and the amount of change acceptable; Establish monitoring methods and frequency; Identify controls and mitigation for management of OHVs; Restrict OHV use to designated routes. If monitoring finds considerable adverse effects, immediate corrective action will be taken, which could include reducing OHV use, signing, barriers, partial closures, seasonal restrictions, or structural solutions s1h(od1(e)7(s)cul(adv)5(e)5(a))4(e)7(s) orn.lity

BMP Name, Objective, and Direction	Locations and/or 'Actions Needed' Where Applies	How to Apply to the Sierra NF Travel Management Project
BMP 7-7 Management by Closure to Use (Seasonal, Temporary, and Permanent): To exclude activities that could result in damages to either resources or improvements, such as roads and trails, resulting in impaired water quality	Any NFTS facility where protection not provided by SW-1 is needed	A last step protective measure that may be applied through the issuance of a Forest Order to close a road for a period other than approved by the Road Closure Plan. The conditions requiring the closure could be due to land use, natural disaster (such as fire, flooding, or landslides), or unusual precipitation / moisture conditions.

Table H- 2. Key to Best Management Practices that apply to each Needed Action

Code	Resource Issue	Action Needed	Applicable BMPs
SW-1	Increased road surface erosion and sediment delivery due to use when road is wet	Wet season closure to reduce sediment generated from motorized use; compliance with LRMP (BMP 2-24; BMP 7-7)	N/A
SW-2	Runoff causing erosion due to inadequate drainage	Construct drainage structures spaced for appropriate gradient and soils (BMP2-7), or heavy maintenance of existing drainage structures. Use of mechanized equipment, construct during period with adequate soil moisture for compaction.	1-8; 2-11; 2-12; 2-13; 2-19; 2-22
SW-3	Runoff causing erosion due to inadequate drainage, in fine textured soils or steeper gradients	Construct drainage structures with hardened tread spaced for appropriate gradient and soils (BMP2-7). Use of mechanized equipment and construct during period with adequate soil moisture for compaction.	1-8; 2-11; 2-12; 2-13; 2-19; 2-22; 2-23
SW-4	Runoff causing erosion due to inadequate drainage, on single-track trails	Construct drainage structures by hand (BMP 2-7)	N/A
SW-5	Drainage structure outlets forming gullies and / or delivering sediment to channel or riparian area	Provide sediment filter/energy dissipater using hand work. (BMP 2-7)	N/A
SW-6	Human caused fill or deposition in creek channel	Remove fill from channel and redistribute on trail tread to provide for proper channel function (width/depth).	1-8; 2-11; 2-12; 2-13; 2-14
SW-7	Sediment delivery to creek with CWE occurrence, or excessive sediment delivery to any creek	Stabilize approaches to channel crossing using aggregate or other hardening techniques (concrete blocks, geoweb, etc). Moveable material will not be placed within the high water channel area. (BMP 2-23)	1-8; 2-7; 2-12; 2-13; 2-23
SW-8	Vehicles crossing perennially moist stream channel interfere with proper channel function (channel bank failure, widening, excessive sediment, capture of stream flow)	Install crossing structure (bridge, bottomless arch, single or multiple culverts) that provides for proper channel function and passage of flow and aquatic organisms (BMP 2-17). Using mechanized equipment.	1-8; 2-12; 2-13; 2-14; 2-17
SW-9	Vehicles crossing stream channel interfere with proper channel function (channel bank failure, widening, excessive sediment, capture of stream flow)	Install low water crossing structure that provides for proper channel function and passage of flow and aquatic organisms. Using mechanized equipment. (BMP 2-17)	1-8; 2-9; 2-12; 2-13; 2-14; 2-17 (if perennial)

Code	Resource Issue	Action Needed	Applicable BMPs
SW-10	Improperly functioning existing culvert	Repair and/or replace with appropriate crossing for proper channel functioning using mechanized equipment. (BMP 2-17)	1-8; 2-12; 2-13; 2-14; 2-17 (if perennial)
SW-11	Improperly functioning existing culvert	Repair for proper channel functioning by hand (clean culvert).	N/A
SW-12	Erosion of inboard ditch	Rock ditch to prevent erosion (BMP 2-7, 2-22)	1-8; 2-12; 2-20
SW-13	Existing trail improvements such as drainage structures, hardened tread, cribwalls, or bridges are not functioning and/or need maintenance	Maintain existing trail improvements (BMP 2-22)	1-8; 2-10; 2-12; 2-13; 2-17
SW-14	Rutting, severe rill, and / or minor gully erosion	Grading using mechanized equipment during period with adequate soil moisture (BMP 2-22).	1-8; 2-11; 2-12; 2-13
SW-15	Severe gully erosion	Restore/stabilize segments of trails by reshaping, revegetation and/or mulching, provide for adequate drainage. Use of mechanized equipment, work during period with adequate soil moisture for compaction.	1-8; 2-11; 2-12; 2-13
SW-16	Severe impacts to soils, riparian areas and / or water quality, or inconsistent with RCOs	Minor realignment within 15 meters of existing centerline. Use of mechanized equipment, work during period with adequate soil moisture for compaction.	1-8; 2-1; 2-9; 2-11; 2-12; 2-13; 2-19
SW-17	Severe impacts to soils, riparian areas, springs, and / or water quality, and inconsistent with RCOs	Reconstruction or major realignment over 15 meters from centerline. Action required (additional NEPA) prior to bringing this track into the NFTS. Use of mechanized equipment, work during period with adequate soil moisture for compaction.	1-8; 2-1; 2-9; 2-11; 2-12; 2-13; 2-19; 2-26; 7-3
SW-18	Motorized use impacting soil / watershed resources near lakes or streams in MA11	Designate end of motorized trails at least 300 ft from lake and stream destinations, per LRMP. Provide barriers and parking.	N/A
SW-19	Continued use on non-designated features having impacts on soil / watershed resources such as meadows, riparian areas, or streams, or multiple trailing due to problems on trail (mudholes, gullies, etc).	Provide barriers to block access to non system trails, undesignated problem bypass trails, or areas that impact sensitive soils, riparian areas, or streams. In some cases also rehab or obliterate so use cannot continue on non-system feature (BMP 2-26). Use of mechanized equipment.	1-8; 2-12; 2-13

Code	Resource Issue	Action Needed	Applicable BMPs
SW-20	Continued use on non-designated features having impacts on soil / watershed resources such as meadows, riparian areas, or streams, or multiple trailing due to problems on trail (mudholes, gullies, etc).	Provide barriers to block access to non system trails, undesignated problem bypass trails, or areas that impact sensitive soils, riparian areas, or streams. In some cases also rehab or obliterate so use cannot continue on non-system feature (BMP 2-26). Accomplished with hand work.	N/A
SW-21	Off-track motorized use having impacts on sensitive soils, meadows or other riparian areas, or stream channels.	Signs, barriers, or modification of area using hand tools (such as placement of debris or establishment of native vegetation) to prevent motorized incursion into sensitive area.	N/A
SW-22	Need for bridge previously identified, NEPA already completed for bridge	Construct bridge, per existing plan, prior to bringing this track into the NFTS.	1-8; 2-9; 2-10; 2-12; 2-13; 2-14; 2-17; 2-20
SW-23	Track at top of unstable streambank impacts riparian vegetation and water quality	Block both ends of track. Leave turnout for parking at east end, but close west end at the edge of PK-31x to protect streambank. (There is one additional parking spot on PK-31x.) (BMP 4-9)	1-8; 2-11; 2-12; 2-13
SW-24	Now TR-x		1-8; 2-11; 2-12; 2-13; 2-19
SW-25	Runoff from adjacent system road or undesignated tracks contributes to erosion of track	Improve drainage on contributing features to control erosion on designated track (BMP 2-7)	1-8; 2-11; 2-12; 2-13; 2-19; 2-22
SW-26	Widespread runoff from upslope sources creates drainage and erosion problems	Determine upslope source of runoff and develop an effective strategy to stabilize track	N/A
SW-27			